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The Hidden Curriculum and the Professional Formation of Responsible Engineers: A Review of Relevant Literature in ASEE Conference Proceedings

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Introduction

How ought we to think about engineering educational innovation and the mechanisms available for achieving it, particularly in shaping responsible engineers? Across the field of engineering education research, educational interventions and empirical studies to support them have focused extensively on "backward" course and curriculum design, an analog to the traditional engineering design approach [1]. Such an approach to designing courses and curricula encourages engineering educators to start by articulating and formulating desired student learning outcomes, and then to "engineer" (identify, specify, validate) the appropriate pedagogies and learning activities to achieve student learning outcomes as well as the appropriate assessment strategies to evaluate the efficacy of those activities for meeting stated outcomes. Such an outcome-driven, backward design approach arguably serves as the dominant paradigm for designing both courses and curricula in engineering education.

In parallel with the formalized, explicit educational programming achieved through backward design, however, lies what education scholars have termed the "hidden curriculum" (HC)—the set of structured learning experiences or conditions that occur beyond design intent and apart from the explicit curriculum. Engineering education scholars have increasingly recognized HC as foundational to engineering students' overall learning as well as the development of their professional identities [2] [3]. Compared to the explicit curriculum, HC is typically unintentional, unplanned, and less "controllable"—seemingly irrelevant to formalized learning outcomes. Its hiddenness makes it difficult to assess, or even anticipate, its impacts on students' development and even more difficult to deliberately align with desired learning outcomes. Nevertheless, as engineering education scholars have identified, HC consistently places performance or "learning" expectations upon students the same as the explicit curriculum, and the impact of these expectations disproportionately penalizes students who are less familiar with or who do not share the implicit assumptions undergirding HC, that is, students from social groups already marginalized by and underrepresented within engineering [2]. Hence, education researchers have argued that educational reform that does not account for HC and its parallel existence alongside the explicit curriculum typically fails to achieve the anticipated degree of impact on educational outcomes [4] [5].

Since the 1960s and 70s, interest in HC—as both an analytic framework and an object of analysis—has traveled from education research into other disciplines, entering medical education discourses in the 1990s [6] and more recently moving into engineering education [7] [8] [9] [10] [11] [12] [13] [14]. As engineering educators consider how curriculum reform might help achieve desired student learning outcomes, attending to HC and its effects—particularly in response to calls to diversify the engineering pipeline [15]—may lead to more effective interventions by accounting for the totality of the engineering curriculum—those structures, both formal and informal, that systematically shape student experience and program output.

Our interest in HC lies specifically in ethics learning within engineering education, so we seek to understand how HC subtly yet powerfully communicates to students, both within and outside of the classroom, the set of moral values and norms engineers are expected to hold and abide by [16]. Despite that numerous empirical studies have demonstrated the efficacy of various interventions in improving students' ethical judgment-making [17] [18], scholars have also expressed concerns regarding fundamental limitations of these seemingly "successful" interventions. For instance, despite increasingly diverse ethics education programs in most engineering programs (some of which have been empirically validated), sociologist Erin Cech has discovered that engineering students' interest in public welfare actually declines over their course of study [19]. Some scholars have gone further to identify pervasive and persistent beliefs and values, evident across engineering educational settings, that unintentionally undermine ethical awareness, even as formalized educational programs seek the opposite [20] [21].

Illustrating the Hidden Curriculum

While hidden curriculum is an expansive concept with sometimes divergent conceptualizations, we will provide an illustration as a way to concretize the analysis that follows. Drawing from empirical research into implicit and explicit dimensions of ethics education in engineering, one undergraduate student shared the following anecdote:

> *I took a 1-credit class that was a nuclear [engineering] class, I think my first or second semester…. And we had probably six or seven different nuclear engineers come and talk to us about what they did. And none of them dealt with weapons. And there were always a couple of people in the class that were like, 'Hey, could you make a nuclear bomb out of this?' or like, 'Oh, how does that work; how could you make a nuclear bomb?' And the professors always just laugh and just say a couple of things about it, general knowledge, and then just move on.*

Interpreting this anecdote through the lens of hidden curriculum identifies a variety of potential implicit "curricular" lessons. First is the qualification that this introduction to the field of nuclear engineering is a 1-credit course. Where courses entail the typical 3 or 4 credit hours, noting the credit hours is rare; however, a low-credit-hour course like this is understood to play a particular role in the curriculum. Indicating this course as a 1-credit class places it in a role of curricular supplement: Important enough to include as a stand-alone course but serving in a subordinate role to regular courses and usually taken above and beyond one's regular load of courses. This dimension of HC includes the hierarchy of legitimate topics represented across the curriculum, with professional exposure courses (like this one) serving to supplement the students' regular course load.

A second implicit lesson is that the topic of nuclear weaponry—even as a point of discussion—is apparently outside the scope of the course, despite evident student curiosity and the seemingly logical connection of nuclear weaponry to the course theme (including the pervasiveness of engineering careers directly or indirectly connected to the military sector [22]). The topic of nuclear weaponry repeatedly goes unaddressed, and students repeatedly seek to bring it up. This dimension of HC includes those topics *notably absent* from the formal curriculum, notable especially when their inclusion would seem to be reasonable or even likely. A third implicit lesson extends the second and is conveyed by the *quality of interactio*n between students and faculty participants, or at least how the quality of that interaction was interpreted by the student quoted above: "*the professors always just laugh and just say a couple of things…and then just move on.*" There is room for interpretation of this quotation, but it is reasonable to suggest this student experiences the guest faculty as uncomfortable with the topic of nuclear weaponry and seeking to avoid discussing it. This dimension of HC covers the wide range of implicit and explicit but subtle messages about what is appropriate to discuss within a given context and, by implication, what topics are considered in and out-of-bounds in various curricular settings.

In this illustration, HC is cast as a largely diffuse phenomenon, highlighting the instructors' discomfort but not targeting any category of student in any particular way. In contrast, much of the literature on HC focuses on the negative impact instructor assumptions and modes of communication can have on particularly situated students, often including students from underrepresented groups. This inflection of HC will be addressed more systematically below.

Research Questions

In this paper, we review engineering education literature on HC and leverage our findings to better understand engineering students' professional formation from a more holistic perspective. Our analysis is organized around three sets of questions:

1) How is HC conceptualized or defined in the literature, and which of its features are highlighted?
2) How is HC employed as a tool for theory building and/or data analysis and interpretation, and what issues in engineering education, and specifically engineering ethics education, have been addressed using the lens of HC? and
3) What gaps can we identify in the literature on HC—again, specifically those related to ethics education—and what opportunities do these present for future research on HC and engineering ethics education?

After describing our methods, we present our analysis of publications that engage with HC from the ASEE PEER database. We then discuss the implications of our findings, highlighting how HC may be unavoidable but could be productively repurposed in more holistic curriculum reform that leverages its "hidden power." We conclude the paper by proposing systematic research that investigates the role of implicit educational messaging in shaping students' sensemaking around professional responsibility and the ethical ramifications of engineering practice.

Methods

This paper is the second in a series of explorations into the intersection of HC and ethics education in the professions. Previously, we explored HC and ethics in medical education research [23]. This current paper explores HC and ethics in engineering education research by systematically reviewing related research in the ASEE PEER online database (https://peer.asee.org). PEER is the largest research publication database for engineering education research, with the most diverse representation of engineering education researchers. PEER includes a record of all ASEE conference proceedings since 1996.

To identify relevant research, we first queried PEER using the search terms “hidden curriculum” and “hidden curricula.” We then manually filtered out results in which the search terms did not appear in conjunction with one another (i.e., the publication used both “hidden” and “curriculum,” but not “hidden curriculum”) as well as those in which the search terms only appeared as part of author bios, leaving us with a total of 33 publications. Of those 33 publications, 26 engaged with HC directly in the text and 7 cited other publications with HC in the title but did not discuss the concept themselves. The 26 publications that did directly address HC fell within a date range of 2001 to 2020, with the heaviest cluster (18) occurring in the past five years: There were 4 publications in 2015, 3 in 2016, 5 in 2018, 4 in 2019, and 2 in 2020, together accounting for the majority of all ASEE publications in this area.

We read each of the 26 publications directly addressing HC and coded them according to the following criteria: the role and context of HC in the analysis; whether the influence of HC on engineering education was described as primarily negative, positive, or neutral; and whether HC was related to engineering *ethics* education (and, if so, how). Our goals with this categorization schema and resulting analysis of findings were to produce a high-level characterization of how HC has been operationalized and deployed in engineering education research as well as to identify promising opportunities to extend research at the intersection of HC and engineering ethics education.

The results of our categorization activity will be described in general terms with the goal of orienting ourselves and our readers to this body of research. Admittedly, our research team is relatively new to this literature, and hence our analysis is tentative and primarily externalist; we have not internalized the shared assumptions or analytic conventions presumably present among the relatively small group of engineering education scholars working with HC (though more on the extent of analytic convergence in this area below). As a result, we expect that we will necessarily gloss important contributions and miss key nuances. We also risk classifying scholars in ways that they may not self-identify. In order to remain at a high-level of generality—characterizing the field of relevant work and its topography—we have chosen not to identify individual publications within each categorization or to justify such categorizations but instead merely to provide our tentative results along with select illustrations. We provide the entire set of publications reviewed as part of this analysis in the Appendix.

Results and Analysis

The 26 publications we analyzed treated HC as both a theoretical concept and as the object of analysis, with the majority (18) falling into the former category. However, we found limited consistency with respect to how HC was defined or which authors were cited as sources for the concept as it was employed. The 26 publications reviewed cited a total of 31 different publications about HC, with no single publication being cited by more than 3 of the 33 reviewed publications. Conceptualizations of HC included:

- The pervasive but implicit values within engineering education programs and institutions and how those values are communicated;
- The set of structural inequalities within society that advantage some students while disadvantaging others; and

- Any part of students' learning experience that is not explicitly included in the formal engineering curricula, from extracurricular activities to implicit messages that students receive in the classroom to what is communicated via the "null curriculum," i.e., those decisions about what *not* to include in the formal curriculum.

Only 3 papers conceptualized and engaged with HC as part and parcel of a curriculum itself rather than as the surrounding context for a curriculum or as an analytically separate phenomenon.

We categorized the publications' engagement with HC into three general groups:

1) HC as something that is outside of, and usually oppositional to, the formal curriculum, typically ignored in most cases but which could be productively put to use if first made visible, e.g., conceptual understandings of a topic that are not addressed explicitly in course materials, extracurricular activities like student clubs and professional organizations, or reflexive activities that are designed to elicit personal biases;
2) HC as something endemic to culture and/or society beyond engineering, e.g., stereotypes about individuals and their abilities, or structural inequalities affecting access and inclusion; and
3) HC as part of engineers' enculturation process, specifically within educational contexts, e.g., the values that faculty impart to students by choosing what to include/exclude in course materials, or the implicit messaging that students receive about the importance of ethics by how it is—or is not—incorporated into course work.

There was considerable overlap among these different groups, as we assigned 9 publications to two categories.

We classified a majority of the papers (15) into category 1. Among these papers, engagement with HC fell into two general camps. The first camp included those (5) that sought to expose the presence and influence of HC in order to better understand and address structural inequalities in engineering education, with the goal of improving the experiences and retention of marginalized students. These authors tended to interpret HC as an inevitable manifestation of existing structural inequalities. The common presumption was that by explicitly identifying and calling attention to HC's implicit values and associated expectations, engineering educators could mediate the negative influence of these forces on students, particularly marginalized students. The second camp entailed the majority of publications (10) in category 1. These proposed specific methods for making HC visible in order to improve the efficacy of meeting desired learning outcomes of the formal curriculum. Identified interventions included: micro-insertions in the classroom (see [24], not part of our review set); reflexive writing and thinking assignments; interdisciplinary lessons; extracurricular activities like student clubs, service learning, or summer camps; and new assessment criteria for culminating student experiences. Structured reflections, interdisciplinary assignments, and reworked assessment criteria invite participants to make elements of HC explicit, thereby providing spaces and times for critical engagement, while extracurricular activities fulfill a complementary role by leveraging HC to cultivate more broad-based engineering skills that are not part of formal curricula. Notably, 3 publications specifically articulated how the surfacing of HC could enable broader curricular reform, including one that discussed the possibility of emphasizing ethics as a core engineering competency. We address the significance of this approach to HC in more detail in the Discussion section below.

Categories 2 and 3 included 8 and 11 publications, respectively, with 2 overlapping both categories (for a total of 17 unique publications). HC was not the primary focus for most (14) of these papers, but rather was referenced as a contributing factor to the object of research. For these papers, the presence or influence of HC was taken as an established fact—a given—and used as a causal factor in explaining low retention rates for women and students of color, the existence of stereotype threat and its detrimental impact on student performance, or the pernicious value systems within engineering educational environments that devalue consideration of ethics and/or social impacts. We describe the use of HC in these contexts as a synonym for "ambient culture"—that is, the tacit but pervasive structures of meaning and patterns of behavior that are difficult if not impossible to control or adjust directly. Such ambient culture could refer to either a) engineering educational or professional communities specifically or b) society at large. However, in the (3) publications that did incorporate HC as part of the primary analytic focus, the authors located HC within specific institutional structures, including both engineering schools and engineering professional societies. In these cases, the authors treated HC as *localized cultural influences* on engineering educational experiences and professional identity development.

Of the 26 publications, 7 addressed ethics as well as HC, either as the primary topical focus (3) or as one among several concerns related to HC (4). Of the 3 in which ethics was the focus, 1 was a survey of students' and instructors' perceptions of ethics education in engineering and their own individual practices concerning ethics. The authors argued that HC often conflicts with the expressed goals of ethics education by undermining those same goals, for example when implicit messaging or actual behavior contradicts explicit lessons around ethics—including among students, between instructors and students, or within the institutional structure. The other 2 publications each addressed mentoring relationships and professional engineering codes of ethics as strong influences on the development of students' ethical awareness. Both of these papers emphasized how instructors play a crucial role in communicating the relevance of ethics to professional engineering identity, either by encouraging students to develop their own ethical code as a fundamental part of professional development or by leading them to believe that ethics are ancillary to day-to-day engineering work (and thereby, as well, to engineering identity). In this respect, the current state of ethics education in engineering programs appears to be as much, if not more so, the result of HC as of formalized curricular content.

One important outlier among our research set bears special mention for its alignment with our goals in the present analysis. The publication, which we classified as belonging to categories 2 and 3, was 1 of only 3 in which HC was the primary focus. It also offered the clearest articulation among the 3 of how HC could be investigated empirically by proposing an ambitious and comprehensive research program for identifying HC in engineering education. Its authors argued that such research could help students and professors recognize the impact of HC on their own experiences and develop more robust approaches to self-advocacy. In this respect, this publication shared concerns with others positing that surfacing HC—that is, making it more visible and available for critical reflection—was a necessary step to improving equity in engineering education. In the next section, we consider how our own research agenda might complement this approach.

The following two diagrams capture the two major approaches to HC that emerged from our analysis of the relevant literature. Figure 1 illustrates the approach that constructs HC as something outside of, and usually oppositional to, the formal/explicit curriculum. This approach was mainly employed in the category 1 papers we analyzed. Figure 2 shows the other approach that considers HC as a cultural context for the formal/explicit curriculum. HC serves either as something endemic to culture and/or society beyond engineering (category 2) or as part of engineers' enculturation process specifically within educational contexts (category 3).

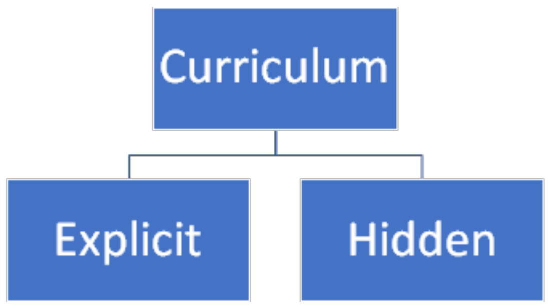

Figure 1 Hidden curriculum located outside of and in opposition to the formal/explicit curriculum

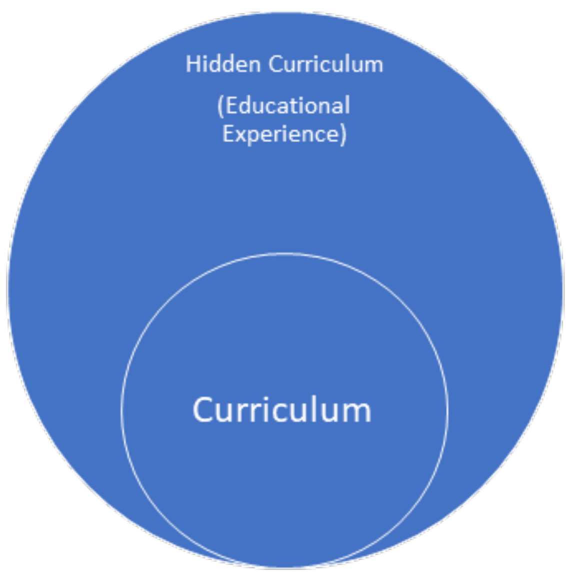

Figure 2 Hidden curriculum as cultural context for the formal/explicit curriculum

Discussion: From *Hidden* Curriculum to Hidden *Curriculum*

One of the key lessons we draw from our analysis is that only a small portion of the publications reviewed (3 of 26) directly engaged with HC *as part of* engineering curricula. Most of them treated HC as external—the educational or social context within which the curriculum (or any curriculum) was implemented—something analytically separate from, and usually oppositional to, the formal and explicit expectations around student competencies. HC was characterized as cultural obstacles to the delivery of the formal curriculum, where presumptions about who is fit to become an engineer result in the very exclusions they presume; HC was characterized as the set of values communicated via the professional enculturation process, where engineers-in-formation are taught what is and is not "real engineering" content; and HC was characterized as the broader social context of the engineering profession, where social biases and inequities flowed into and polluted the purported objectivity of engineering. These approaches have in common a portrayal of HC as that which is not deliberately "taught" to students but nevertheless impacts their learning. Since the impact of these forces is largely negative for already marginalized students, it is imperative that it be made visible and counteracted if equity is to be enhanced in engineering educational settings.

We assess this to be a potent line of argument conveyed by the engineering education literature on HC and an important contribution to understanding the cultural dimensions of engineering education and professional formation. However, this line of argument also highlights in relief another dimension of HC that deserves scrutiny as well. We suggest shifting focus from the *hidden* nature of HC to its *curricular* dimensions, that is, to focus more on the *structural* dimensions of HC and how those structures themselves might be confronted and possibly transformed. This would entail *making visible* and *reflecting upon* the various dimensions of HC, to be sure, as many of the reviewed publications suggest or demonstrate. But it would also entail two additional steps. First would be attention to the systemic features of HC, for example by mapping the relationships among systemic exclusions, predominant conceptions of competence within engineering education, and the diversity of career trajectories of engineering graduates. Second would be *leveraging the hidden power of the hidden curriculum* by recognizing it as an inescapable, potentially transformative component of educational enculturation. It is this step we will explore in the remainder of our discussion.

Taking the concept of HC seriously entails highlighting the central role it plays in shaping the totality of students' learning experiences. We identify three implications to be drawn from this insight:

- HC is an inevitable, perhaps essential, aspect of all education, and hence is imprudent to ignore;
- HC invites us to question the dominant "backward" engineering design approach to educational program development: If HC centrally mediates student learning, then the process in which instructors design instructional strategies to achieve predetermined learning objectives ought to respond to that mediation; and
- Leveraging the hidden power of HC is a sensible and potentially innovative pathway to meaningful educational reform.

Taking each of these implications in turn, we first argue that HC is a fundamental component of the engineering educational experience and should not be ignored. Teaching and learning are never value neutral, and values communications constitute a foundation of all educational practice. Some of values that faculty possess will intentionally or unintentionally affect their curricular designs, assessment strategies, and pedagogical practices. Likewise, all students come to engineering programs with their own values that shape the ways they perceive and understand what their instructors deliver in the classroom. Furthermore, educational technologies and even the settings of learning environments are never value neutral, themselves contributing to the mediation of students' learning experience. Thus, it is ill advised for engineering educators to seek to circumvent the effects of HC despite that HC is often perceived as predominantly counterproductive to educational objectives. We suggest that engineering educators seek to repurpose rather than attempt to eliminate or contain the effects of HC on students' learning. Using the illustration of HC provided in the beginning of this paper, we might suggest that the course coordinator—if present—simply acknowledge the recurrence and legitimacy of students' questions about nuclear weaponry, even if no additional "answer" to the questions is provided and even if no position on nuclear weaponry is taken.

Second, we further argue that HC invites reconsideration of how engineering educators typically think about educational program design, which is predominantly if not exclusively focused on formalized learning objectives. Most papers we analyzed considered HC as a counterproductive force within engineering education and the impacts of HC were interpreted as significant despite lack of awareness of those impacts, both by students and instructors. We call this the *hidden power* of the hidden curriculum: Engineering educators would benefit by critically examining the preconditions and limitations of the linear, outcomes-based, backward design approach to curriculum development [25]. The backward design approach largely assumes that, insofar as we formulate desired learning outcomes, we will be able to engineer effective pedagogies and learning activities that achieve those outcomes in a more-or-less straightforward way. HC teaches us that the process by which faculty determine instructional strategies to achieve predetermined learning objectives could be more dynamic, nuanced, and indirect, with HC playing a central role in mediating students' achievement of desired learning outcomes. Engineering educators should carefully examine the assumption that students will *always* learn exactly what (and not just how much) their backward-design efforts are intended to achieve. And this is true regardless of the level of sophistication of their engineered learning projects and assessment measures. By accounting for HC mediation, we believe engineering educators can take a more *holistic* approach to understanding students' learning experience (and in particular, their moral learning). Considering again our opening anecdote, we would not necessarily advocate adding new learning objectives around nuclear weaponry to what is probably an already-crowded list of course learning objectives, but instead invite instructors to "seize the moment" when educational opportunities like this arise. In fact, it may be that *reducing* curricular content will provide enhanced opportunities for learning by creating room for spontaneous inquiry, exploration, and reflection.

Third, engineering educators who are committed to meaningful, evidence-based educational reform should not neglect the hidden power of HC as they conceive learning interventions. Rather, they should consider leverage this potential to actively shape students' professional and moral identity development. Engineering educators have recently advocated movements to integrate or "infuse" ethics into the engineering curriculum, and the National Academy of Engineering has showcased exemplary education activities and programs that infuse ethics into the development of engineers [26]. While we appreciate these efforts at ethics integration to teach students ethical reflection competencies, we also encourage engineering educators to critically examine the values and messages that might be communicated to students via such efforts. At least a few hidden lessons could be communicated to students via ethics integration activities, including:

- *Why ethics is largely absent from the formal engineering curriculum*
  Ethics is inherent to all human activity—including all engineering practice—but explicit attention to ethics has been stripped out of engineering curricula as engineering thought leaders aspired to achieve the epistemological authority and presumed neutrality and universality of science, thereby decontextualizing "engineering knowledge" from engineering practice.

- *Why ethics content is typically avoided by many engineering instructors*
  Increasingly, engineering instructors themselves have been educated to focus primarily on narrow technical concerns and to think of ethics as separate from core engineering, creating a situation where many feel unqualified to comment upon, not to mention actively teach, ethics content as part of their coursework.

- *Why ethics is hard to systematically add back in to engineering course work*
  For the convenience of teaching ever-increasing content around (technical) engineering principles and theories, many (or possibly most) engineering course problems have been decontextualized from real-world applications and treated, even defined, as exclusively technical.

Taking these insights together, we support mechanisms that explore ethics content communicated via HC as a means to make visible and "re-integrate" ethics and the centrality of human value propositions to engineering problem solving and engineering education.

Conclusion: Toward a Broader Vision of Ethics Education

We would go further to argue for a much broader vision of "ethics"—one that takes seriously the claim that ethics is inherent in all human activity. This line of argument suggests that ethics was never—and never could be—stripped out of engineering knowledge or engineering education. Rather, it suggests that the ethics of engineering education were only transformed in character: The idea that engineering education *ought* to primarily focus (or not) on technical content is itself an ethical position, even as it has become buried in the core assumptions of the field, including in the HC. Taking seriously the inherently sociotechnical nature of engineering, every time a line is drawn to exclude social content from ("real," technical) engineering, an ethical claim lurks just beneath the surface—a claim about the rightness of one definition of engineering over another, about one version of engineering education over an alternative. Rather than claiming that engineering has been decontextualized and stripped of ethics, which now needs to be reintegrated, we could instead point to HC as an ethical lesson about what is considered most important for engineering students to learn and to know—a lesson that is *always already* there to be learned if only it is acknowledged. Therefore, from the perspective of HC, a major task for engineering educators is to make the hidden ethics curriculum already existing in the everyday practice of engineering education visible to students—*and themselves*. Engineering educators can then help students develop capabilities to "unveil" the ethics (or other systems of values and meaning) hidden in engineering educational practice. In the words of philosopher Don Ihde, a truly responsible engineer should *let artifacts speak for themselves* or *let them show themselves* [27]; this applies as well to the artifact that is engineering education.

As suggested by engineering educators interested in phenomenology, one way to help students develop capabilities to unveil the ethical values and meanings hidden in engineering practice is to have students directly encounter some first-person, phenomenological experience of how "the social, material, and historical elements are at work in the constitution of their own agency and lived experience of situations" [28, p. 1392]. To teach students research ethics in human-robot interaction (HRI), a method used by one of the authors of this paper is to ask students to live in different roles (e.g., researcher or participant) and reflect on their first-person experience of how their HRI research design shapes their own personal engagement with the technology (e.g., as a researcher or as a participant). Students serving as research participants realized that choices made in the experimental design (e.g., the strategies the robot employed to persuade the human teammate) were never purely technical but structured the ways in which the human research participant perceived the moral role of the robot and the "credibility" of the robot's claims [29].

If we take the position that ethics is always already present in all human activity, including engineering education program design, instruction, and student learning experiences, while also acknowledging that ethics is nearly invisible within the formal curriculum, it begs the question of how and where ethics manifest. We believe that HC is a potentially powerful tool both for identifying these hidden ethics and for redirecting the learning experience to account for a much broader perspective on ethics as well as on education. Ethics are never gone or decontextualized from engineering. They are always there but *hidden*, and they may take very different forms than most engineering students and professors expect. Potentially, those ethics meanings hidden in engineering education offer the potential for more authentic, and powerful, lessons than formal-curriculum ethics case studies composed by philosophers or engineers that often seem disconnected from the rest of the curriculum or the student's lived experiences. Instead of suggesting "bringing ethics back" into engineering, we suggest it is more sensible to consider how to bring in rich, contextualized, and reflective accounts of actual engineering education in practice, including those many subtle layers of educational experience conveyed via the hidden curriculum.

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